

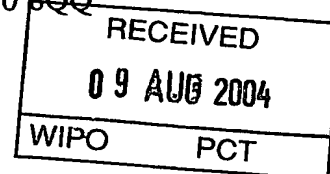
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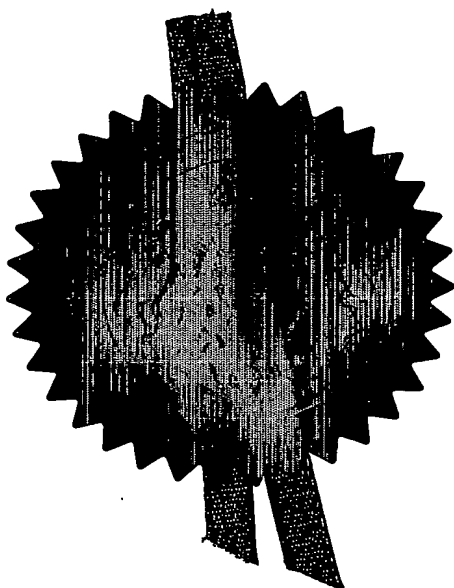


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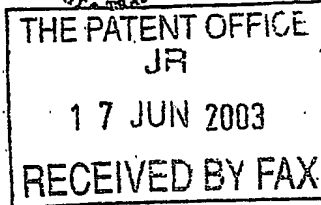
*H. Behan*

Dated 28 July 2004

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Patents Form 1/77

Patents Act 1977  
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1/77

**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
Newport  
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17 JUN 2003

1. Your reference

hyn.2952.uk.mlh

2. Patent application number

(The Patent Office will fill in this part)

0314007.6

17JUN03 E015602 1 010002  
P01/7700 0.00-0314007.6

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Harris Hynd Limited  
Business Innovation Centre  
15 Cromarty Campus  
Rosyth Europarc  
FIFE  
KY11 2YB

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

8099525001

4. Title of the invention

Audio Transducer

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Kennedys Patent Agency Limited  
Queens House Floor 5  
29 St Vincent Place  
GLASGOW  
G1 2DT

Patents ADP number (if you know it)

08058240002 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if

Yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d)).

Patents Form 1/77

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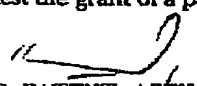
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Request for preliminary examination and search (Patents Form 9/77)	—
Request for substantive examination (Patents Form 10/77)	—
Any other documents (please specify)	—

11. I/We request the grant of a patent on the basis of this application.
- Signature  Date 17 June 2003
- KENNEDYS PATENT AGENCY LIMITED
12. Name and daytime telephone number of person to contact in the United Kingdom David Kennedy - 0141 226 6826

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### Audio transducer

The present invention relates to an audio transducer and panel loudspeakers.

There are various options available in the market, most of which involve the development of a transducer where the electrical current is converted to mechanical movement. These transducers have pistonic movement, while the panel may have several nodes of movement; the permanent attachment of the transducer components to the panel alters the behaviour of the panel. Although there are various different ways to solve the above problem, they have some limitations and are relatively expensive to produce.

The basis of our technology relates to the use of an intermediate element between the transducer and the panel giving the following advantages:

- The first function of the added element is to enclose all of the components, but simultaneously giving some flexibility to the structure of the product.
- The flexibility of the setup transmits the movement to the panel without constraining its own modes of movement, which ensures an accurate sound fidelity.
- The flexible attachment allows movement at the contact point between the exciter and the panel resolving panel stress and damage issues.
- The transducer does not need spider.
- The added element acts to aid heat dissipation and protects the panel from overheating.
- Compatibility with a wide range of rigid panels, due to the method of installation.
- The perfect alignment of all parts allows manufacturing the exciter with a thin air gap, improving the transduction efficiency.
- Improved load bearing.

According to a first aspect of the invention there is provided an audio transducer having a coil, a magnet, and a hydrogel retaining means for supporting the magnet and coil in relation to one another.

According to the second aspect of the invention there is provided an audio transducer having a moulded retaining means for retaining a coiled and magnet in a spatially separated relationship.

According to the third aspect of the invention there is provided an audio transducer as herein described.

According to the fourth aspect of the invention there is provided a moulded retainer for retaining a coiled and magnet in a spatially separated relationship.

The following embodiments are exemplary only.

The exciter consists in a moving-coil transducer with a rigid pad attached the end of the voice-coil. All the parts are kept together with a silicon hydro gel component, which simultaneously transmits the movement from the voice coil to the panel.

**Possible applications of the technology:**

- Ceiling tile and audio retailers/manufacturers.
- Hifi manufacturers/retailers.
- Mobile phones.
- Boating and leisure industries.
- Vandal proof requirements and security.
- Clean rooms.
- Military.
- Television and other audio/visual markets.
- ATMs, interactive kiosks.
- Mobile audio/concerts.

As shown in Figure 3. The metal enclosure of the magnet creates a magnetic flux between the North and South Pole. Consequently the voice coil moves when an electrical current is going through it. The rigid pad moves within the voice-coil so the electrical current has been transformed in a mechanical movement of the pad using the simple moving coil transducer principle.

The hydrogel enclosure functions to keep all parts together, simultaneously giving some flexibility to the structure of the device.

The hydrogel enclosure of the example shown comprises a lower disc and a surrounding wall. The lower disc is planar on its front surface and has a plurality of concentric circular ridges on its upper surface.

The surrounding wall has an inclined outer surface so that the outer diameter at the base of the wall is greater than that at the top of the wall. The hydrogel enclosure therefore takes on a frusto-conical form.

The inner diameter of the surrounding wall varies to accommodate the internal components of the transducer. The inner diameter at the base of the enclosure allows accommodation of the rigid pad. The inner diameter of the surrounding wall immediately above the rigid pad is decreased to the outer radial dimension of the voice coil.

Continuing to move in a direction away from the front side of the enclosure, the inner diameter of the enclosure increases in order to accommodate the metal enclosure around the voice coil. At the upper portion of the hydrogel enclosure, the inner diameter is decreased to form an internal lip for retaining the metal enclosure, with an air space between the metal enclosure and the coil. In this example, the back side of the metal enclosure is exposed through, and extends beyond, a window in the back of the hydrogel enclosure.

The geometry of the hydrogel enclosure directs the major movement to the area where there is contact with the panel, improving the movement in this side of the exciter, and minimising or nearly cancelling the movement on the back side of it.

The hydrogel is moulded as a single piece. The components of the exciter are mounted concentrically.

The exciter is pressed onto the panel through the front side of the hydro gel. The function of the gel is transmitting the energy from voice coil vibrations (which are relatively big) and transform this energy to the panel side as smaller vibrations in a bigger area of the panel. Consequently, the vibrations turn the whole display into a loudspeaker and as a result, produce a high quality sound in the high, medium and low frequencies range.

Designed to work on a wide range of surfaces such as foam display board, metal, glass and plastic enclosures gives the ultimate flexibility. The properties and the manufacturing process

of the Hydro gel add advantage to the unit in the way it is fixed to the panel within seconds and can be attached and re-attached without damage to the panels/displays.

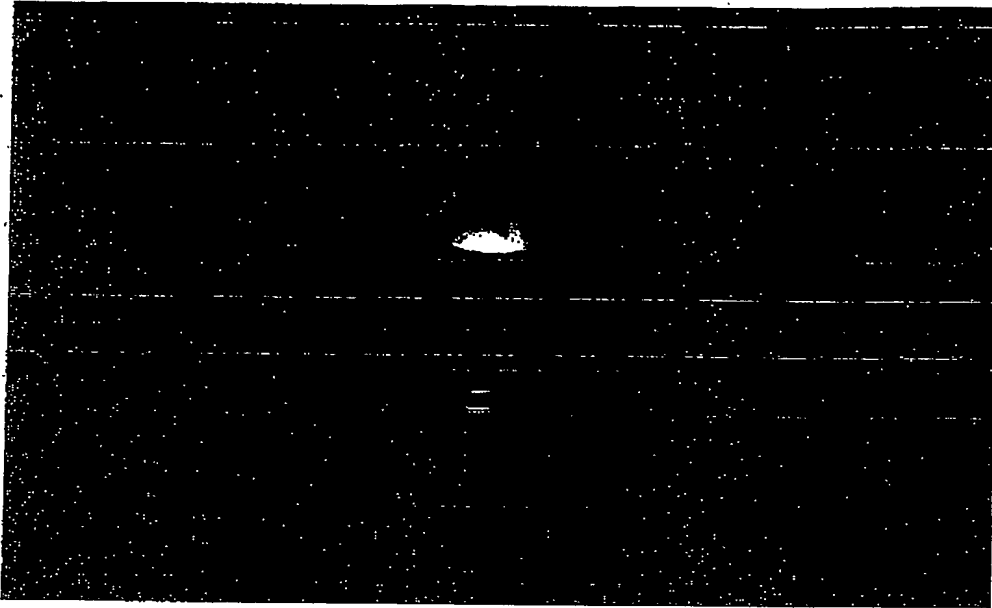
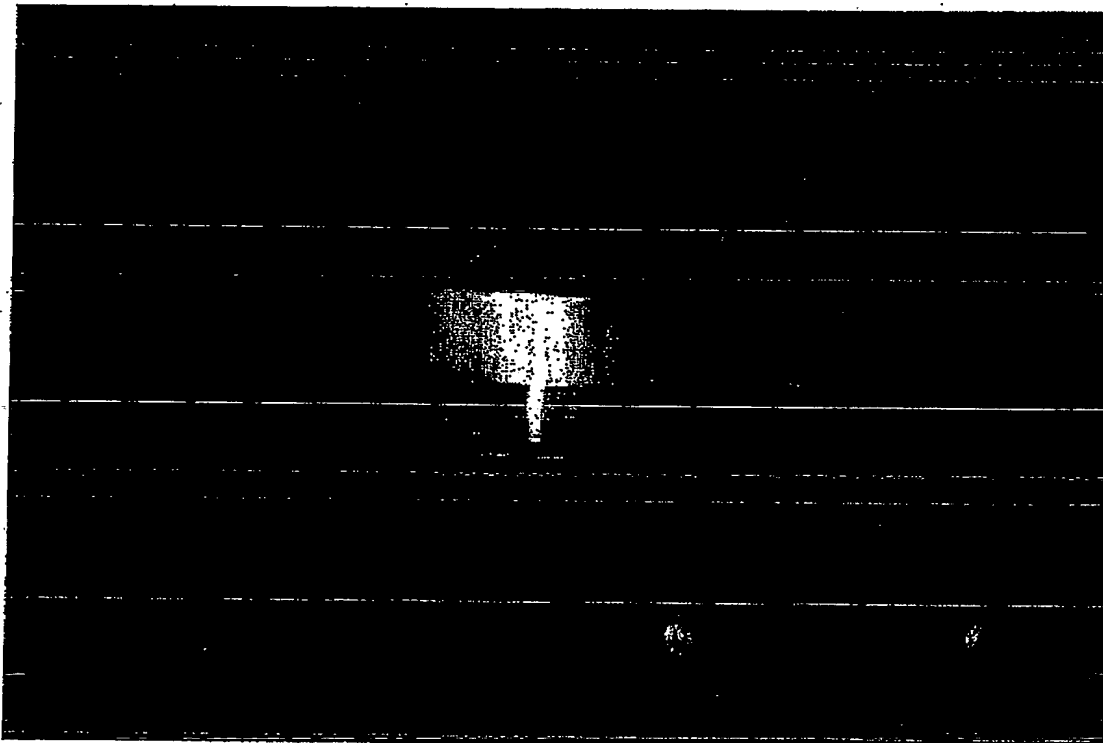
List of the main advantages:

- The flexibility of the hydro gel transmits the movement to the panel without constraining its own modes of movement, which ensures an accurate sound fidelity.
- The flexible attachment allows movement at the contact point between the exciter and the panel solving panel stress and damage.
- No need of spider. The hydro gel layer between the voice coil and the panel, aligns the movement of the voice coil, and minimises the stress to the coil and rattling caused by misalignment.
- The hydro gel acts to heat dissipation and protects the panel from overheating.
- Compatibility with a wide range of rigid panels, due to no need of bonding the exciter with the panel.
- The perfect alignment of all parts allows manufacturing the exciter with a thin air gap, improving the transduction efficiency.
- Due to the non-bonded fixation of the transducer to the panel, the weight of the unit is not supported by the exciter.
- Power consumption.

The device should be driven by AC. It can be made with the standard loudspeaker Impedance. 4, 6 or 8 Ohm with power handling up from .5 – 100W

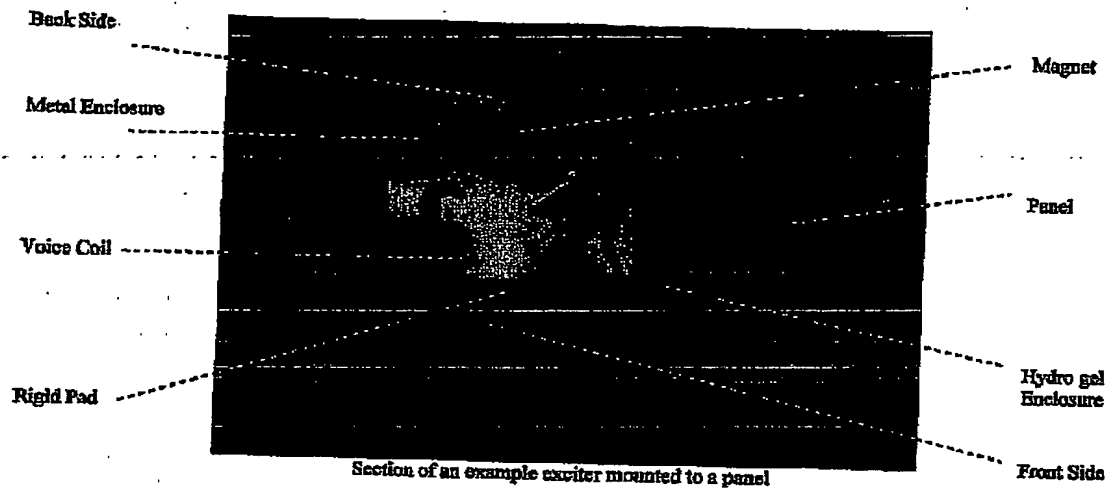
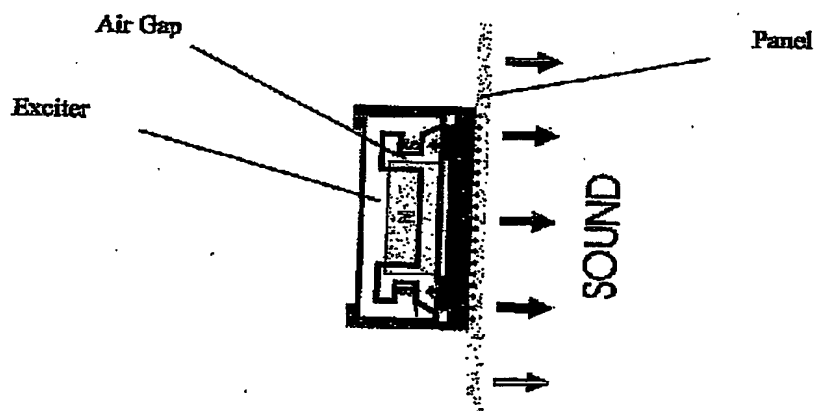
We feel that the innovation lies in the following areas:

- The way that the device is attached within a panel without using any kind of glue, and allowing the transportation of mechanical waves.
- The method use to excite the panel. Having the ability of change the amplitude of a normal transducer to a smaller amplitude required for the panel.
- The ability of produce a high quality sound between 50 to 18000Hz using only one transducer.
- The ability of the hydro gel to keep all parts together, but at the same time gives some flexibility to the structure of the product.
- The unit is fixed to the panel within seconds and can be attached and re-attached without damage to the panels/displays.
- The flexibility of the hydro gel transmits the movement to the panel without constraining its own modes of movement, which at the end minds an accurate sound fidelity performance.
- The flexible attachment allows movement in the contact point between the exciter and the panel solving panel stress and damage.
- The hydro gel layer between the voice coil and the panel, align the movement of the voice coil, and minorities the stress and rattling of that one. No need of spider to centre the voice coil.
- The hydro gel acts as a heating dissipation and protects the panel of overheating.
- Compatibility with most of the rigid panels due no need of bonding the exciter with the panel.
- The perfect alignment of all parts allows manufacturing the exciter with a thin air gap, improving the transduction efficiency.
- Due the non-bonded fixation of the transducer to the panel, the weight of the last one is not held by the exciter.

$\frac{1}{2}$ **Figure 1****Figure 2**

Exciter mounted to a panel

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**Figure 3****Figure 4**



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